Performance of Cobb 500 broiler chicks feed by Chamomile alcoholic extract

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Abstract

This study was performed to evaluate the effect of chamomile alcoholic extract on performance, some blood parameters and intestinal characteristics of broiler chicks. A total 320 one day old Cobb 500 broiler chicks were randomly divided into 4 treatments. Treatments were further divided into 4 replicates. Chicks were fed a basal diet as control group, basal diet with 0.3% chamomile extract (S1), basal diet with 0.5% chamomile extracts (S2) and basal diet with 0.7% chamomile extract (S3). The experiment was carried out of 42 days. Feed intake FI and body weight gain BW was calculated for estimation of feed conversion ratio FCR. At the end of experimental period (42 days), to determine carcass traits and other parameters, 2 birds form each replicate were slaughtered. Additionally, the blood serum samples were subjected to biochemical analysis. For determination intestinal characteristics, small intestine tissues were collected. Data from this study showed that improvement of body weight gain and feed conversion were found in chamomile extract groups ($P<0.05$).There were significant differences between carcasses traits in treatments feed by chamomile extract. As result reveled from this study serum triglyceride, cholesterol LDL decreased in groups fed by chamomile alcoholic extract and HDL increased significantly ($P<0.05$) instead. In addition, villus height decreased in S1and S2 groups. An increasing crypt depth was seen on S2. According to these data villus widths, epithelium layer and goblet cells increased by using chamomile extract specially by using S2. In conclusion, we could demonstrate that chamomile alcoholic extract may be used as ingredient in broilers ration without harming effects on carcass characteristics, blood biochemical parameters, and intestinal morphology of Ross 308 broiler chicks.

Introduction

Chamomile (*Matricariachamomilla*) has been used in ethno medicine throughout history. It belongs to a major group of cultivated medicinal plants.[1] It contains some group of active compound classes such as sesquiterpenes, flavonoids, poly acetylenes and coumarins. Herniarin and umbelliferone (coumarin), caffeic acid (phenylpropanoids) and chlorogenic acid, apigenin, apigenin-7-O-glucoside, luteolin and luteolin-7-Oglucoside (flavones), quercetin and rutin (flavonols), and naringenin (flavanone) are found in chamomile extract. The coumarins are represented in chamomile by herniarin, umbelliferone, and (Z) - and (E)-2- β-d-glucopyranosyloxy-4-methoxycinnamic acid, the glucoside precursor of herniarin, were described as native compounds in chamomile.[2,3] Kolacz *et al.* showed that chamomile flowers inhibit the excessive growth of intestinal harmful microorganism, thus counteracting inflammation.[4] Abo Omar *et al.*[5] showed that supplementation of chamomile flowers at level of 2.5 kg/ton of broiler diet improved growth performance and feed conversion. Natural feed additives had beneficial effect for stimulation and activity of digestive system by improving the diet palatability and enhancing appetite of poultry, thus increasing the amount of feed consumed.[6,7] The pharmacological action of herbal extracts and their active materials in humans is also well known, but in animal nutrition the number of precise experiments is relatively low.[8] For this reason, the objective of this study was to explore the potential uses of chamomile alcoholic extract on performance, some blood parameters and intestinal morphology in Ross 308 broiler chicks.

Materials and Methods

The present study was conducted during 42 days at poultry farm of veterinary college, Islamic Azad University, Shahrekord branch, Shahrekord, Iran.

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Experimental plan

A total of 320 commercial (Ross 308) days old male (sexed) Cobb 500 broiler chicks were divided into four treatment groups and were further subdivided into four replicates. The experiment was done due 01.05.2017 to 12.06.2017. Chamomile flowers obtained from herbalists, cleaned and powdered then extracted according to Harborne's method,[9] then mixed with the experimental diets. The treatments were divided as basal diet with no chamomile extract kept as control; basal diet +0.3% of chamomile extract (S1), basal diet +0.5% of sumacs chamomile (S2), basal diet +0.7% chamomile extracts (S3). All diets of each period were prepared with thesame compositionand they were isoenergic and isocaleric. Diets were formulated to meet or exceed the requirements of NRC recommendations.[10] Also, feed and fresh water was provided *ad libitum* during this experiment.

Data collection

The data on growth performance were collected for the following parameters:body weight (g), feed intake (g), feed conversion ratio (g), carcass yield (%), and edible part weight (g). The body weight of individual bird was recorded on weekly basis. Daily

feed intake was calculated for estimation of weekly feed conversion ratio (FCR).At the end of experimental period, two birds form each replicate were slaughtered for determination of carcass traits and other parameters. Body parts were separated and weighed as percentage weight. Dressing percentage was calculated free from giblets and the organs were weighed separately as percentage of carcass weight. The point spread, performance index and production efficiency factor were also calculated for evaluating the growth performance. The blood samples were taken from the brachial vein from two birds per replicate and stored at refrigerator at 4°C. Also, the blood serum samples were subjected to biochemical analysis for blood parameters by Pars Azmoon commercial kits. The internal organs were removed after slaughter. Final samples from small intestine tissue were collected for determination of intestinal characteristics. Final samples from small intestine tissue were collected for determination intestinal characteristics such as villus height, crypt depth, villus width, epithelium layer and goblet cells. The histomorphometric investigation was performed by light microscopy, and the measurement was done using public domain image analysis software (Image J, National Institute of Mental Health, Bethesda, MD, USA).[11]

Statistical analysis

Data were collected and analyzed using the General Linear Model Procedure (GLM) and the comparison of means was made through Duncan's Multiple Range by using SAS 9.1 software.[12] See Table 1 for details on the composition of the experimental diets for broiler chicks.

Results and Discussion

Table 2 describes the effect of added experimental diets on broilers performance.

Performance

The data which obtained from performance of broiler chickens fed by chamomile extract are shown in Table 1. Data showed that use of S1, S2 and S3 increased FI significantly ($P<0.05$) compared to control group. Body weight gain and initial live weight were also significantly higher ($P<0.05$) in treated groups.

Cabuk *et al.*[13] noted that the herbal essential oil mixture may be considered a potential growth promoter. Skomorucha and Sosnowka-Czajka[14] showed some positive effect of the addition of 2 mL^{-1}/L chamomile in drinking water on broiler chicken visceral organs.

Mansob showed that using different levels sumac had significant effects on food intake, weigh improvement, average of weight and feed conversion of broilers ($P\leq0.05$).[15]

Overall means in Table 2 showed significant difference in body weight among treatments ($P<0.05$). Ahmadian-Attari *et al.*[16] showed that use of herbal extract can improve growth and have beneficial effect on broilers.

The improvement of body weight gain and feed conversion ration are due to the active compounds such as cinnamaldehyde and ugenol that they found in chamomile, and they are causing better efficiency in the utilization of nutrients and resulting to better growth and performance.[17]

In the present study, FCR was at the lowest in broilers fed by chamomile extract. These results proved that chamomile though being more effective performed to certain extent and have a great potential to be utilized as an alternative. Rayne *et al.* showed that sumac extracts have been found to have antimicrobial, hypoglycemic and antioxidant activities and its lead to better growth and performance for broilers.[18]

Data from (Table 2) showed significant differences for live weight (g) between treatments. In this case the higher live weight was for S2 and the lesser was for control group.

Results of some researcher study showed that weights, feed conversion ratios (FCR) and dressing percentages (DP) increased ($P<0.05$) in birds supplemented with herb extract compared to control birds and mortalities and sudden deaths were minimized via herbal supplementation.[5,19]

Weiner reported that some plants or specific combinations of herbs in formulations may act as antioxidants by exerting superoxide scavenging activity or by increasing superoxide dismutase activity in various tissue sites.[20]

Zhian *et al.*[21] showed that all treatments revealed to chamomile plant had no significant differences on dressing percentage and giblets weight except thighs drumsticks, and heart weight increased significantly ($P\leq0.05$).These results are in agreement with researchers who indicated that, addition of medicinal herbal plants had a significant effect on improving digestibility coefficient and nutritive values.[11,22]

Table 1. Composition of the experimental diets for broiler chicks.

Ingredients %	0-7 (days old)	7-14 (days old)	15-29 (days old)	29-42 (days old)
Corn grain	52.22	53.30	49.25	43.20
Soybean meal	37.5	33	27	23.5
Wheat	6	10	20	30
Calcium Carbonate	1.60	1.50	1.55	1.40
Nacl	0.18	0.20	0.20	0.20
Vitamin Premix*	1.25	1	1	0.85
Mineral Premix*	1.25	1	1	0.85
Calculated nutrient content				
$ME_{(Kcal/Kgr)}$	2830	2870	2920	2960
CP (%)	22	20.5	18.5	17.5
Ca (%)	1	0.95	0.85	0.85
Available Phosphorus (%)	0.50	0.45	0.45	0.40
Lysine (%)	1.34	1.20	1.05	0.95
Methionine+Cystine (%)	0.92	0.85	0.80	0.75

Supplied per kilogram of feed: 7.500 IU of vitamin A, 2000 IU vitamin D3, 30 Mg vitamin E,1.5 µg vitamin B12, 2 Mg B6, 5 Mg Vitamin K,5 Mg vitamin B2,1 Mg vitamin B1,40 Mg nicotinic acide,160 µg vitamin Biothine,12 Mg Calcium pantothenate,1 Mg Folic acid 20 Mg Fe,71 Mg Mn, 100 µg Se, 37 Mg Zn, 6 Mg Cu, 1.14 Mg I, 400 µg Cu.

Table 2. The effect of added experimental diets on broilers performance.

Treatments	FI (g/d)	BW (g/d)	FCR	Live weight (g)	Carcass yield (g)
Control	102.50^{c}	49.70^{c}	2.04^{a}	2088.30^{c}	1424.40^{c}
S1	103.30^{b}	52.11^{ab}	1.95^{b}	2189.40^{ab}	1526.80^{ab}
S2	104.40^{b}	53.50^{a}	1.93^{b}	2249.80^{a}	1587.50^{a}
S3	103.22^{bc}	51.30^{bc}	1.90^{b}	2189.35^{bc}	1490.90^{bc}
P value	0.021	0.011	0.022	0.089	0.060

Means within row with no common on letter are significantly different ($P<0.05$).

Edible organs weight

According to data from Table 3, using of different levels of chamomile extracts lead to decrease abdominal fat statistically (P<0.05). Also, liver weight was higher were broilers fed with S2 (P<0.05) and intestine weight was at the highest for S3 than others.

Abazaet al.[23] demonstrated that chamomile powder at levels of 4 g/kg were significantly increased percentage of bursa of fabercius weight (P<0.05). Also, they noted that improvement in immune responses of broiler chicks by chamomile flower is related to inhibit the harmful intestinal microorganisms, thus counter acting excessive growth. Antimicrobial substances are present in cinnamon can reduce the harmful bacteria populations in the gastrointestinal tract and improve the levels of absorbed amino acids.[15,24]

Data from Table 4 showed that triglyceride, cholesterol and LDL tended to decrease by using chamomile alcoholic extract and HDL increased significantly (P≤0.05).

The supplemented broiler diets with chamomile essential oil have a beneficial effect on broiler performance and plasma cholesterol and glucose.[25] As result relieved from Al-Moramadhi *et al.*[19] study significant decrease (P≤0.05) in glucose and cholesterol concentration was showed in treatments compared with the control.

Cemeck *et al.*[26] found that the ethanolic extract of chamomile inhibit the formation of free radicals and may scavenge the reactive oxygen metabolites through various antioxidants compounds in them. In another hand Fiddler *et al.*[27] found that chamazulene, the active ingredient in chamomile effect free radical processes and inhibit lipid per oxidation.

Phenolic compounds that found in some herbals inhibit lipid per oxidation, scavenge the superoxide anion and hydroxyl radical described by other researchers (Table 5).[2,28] Additionally could enhance the activities of detoxifying enzymes such as glutathione-S-transferase.[23,29] For example D-limonene (l-methyl-4-(1-methylethenyl)-cyclohexane) is a monocyclic monoterpene component of sumac that has hypo-cholesterolemic effects.[3]

Intestinal characteristics

Using of chamomile extract affect intestinal characteristics such as villus height, crypt depth, villus width, epithelium layer and goblet cells. Villus height was decreased by using S1 and S2.The highest increase for crypt depth was seen on S2. According to these data villus widths, epithelium layer and goblet cells were increased by using chamomile extract specially by using S2.The hypo-cholesterolaemic action of herbals is possibly related to its poly-phenolic components.[8,30] Polyphenols have been shown to depress the reverse-cholesterol transport, reduce the intestinal cholesterol absorption and even increase bile acid excretion.[24,29]

Conclusions

We could be explained that we observed some goods by using chamomile alcoholic extract on performance of Ross 308 broilers. Improvement on performance and growth may be due to some biological functions of that to improve growth or that maybe due to their role as stimulant, enhanced digestibility, anti-oxidant, antimicrobial and properties of them for prevention of gastric toxicity. Although further studies with higher dosage of them are needed to explore and more detail explanation.

Table 3. The effect of added experimental diets on some edible organs.

Treatments	Liver (g)	Abdominal Fat (g)	Spleen (g)	Intestine (g)
Control	40.55^{b}	43.80^{a}	1.85^{a}	78.20^{c}
S1	43.20^{ab}	42.32^{ab}	1.90^{a}	79.30^{b}
S2	44.54^{a}	41.60^{ab}	1.76^{b}	80.00^{a}
S3	43.11^{ab}	30.80^{c}	1.70^{b}	81.50^{a}
P value	0.030	0.024	0.025	0.052

Means within row with no common on letter are significantly different (P<0.05).

Table 4. The effect of added experimental diets on some blood parameters (mg/dL).

Treatments	Triglyceride	Cholesterol	LDL	HDL
Control	70.55^{a}	134.00^{a}	60.00^{a}	67.20^{c}
S1	69.25^{b}	133.55^{b}	58.95^{b}	69.10^{b}
S2	68.09^{b}	132.90^{b}	57.26^{b}	70.11^{a}
S3	67.45^{c}	131.25^{c}	56.65^{c}	71.02^{a}
P value	0.022	0.036	0.040	0.26

Means within row with no common on letter are significantly different (P<0.05).

Table 5. The effect of used experimental diets on intestinal characteristics of broilers (Micron).

Treatments	Villus height	Crypt depth	Villus width	Epithelium	Goblet cells
Control	56.95^{a}	20.14^{ab}	6.54^{c}	2.50^{b}	4.50^{c}
S1	56.32^{ab}	20.29^{ab}	7.40^{ab}	2.84^{a}	5.50^{b}
S2	55.33^{b}	21.42^{a}	7.60^{a}	2.82^{a}	6.50^{a}
S2	55.51^{b}	19.35^{b}	6.680^{bc}	2.60^{b}	6.50^{a}
P value	0.060	0.071	0.072	0.076	0.025

Means within row with no common on letter are significantly different (P<0.05).

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